

SUMMARY

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STUDY TITLE

Dow AgroSciences' Response to the U.S. EPA's Environmental Fate and Effects Division
Science Chapter for Oxyfluorfen

DATA REQUIREMENTS

None

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STUDY COMPLETED ON

November 1, 2001

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GH-C 5333

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SUMMARY

U.S. EPA conducted a standard Tier I and Tier II ecological risk assessment and concluded that the greatest risks of oxyfluorfen use were associated with terrestrial plants exposed through spray drift and aquatic organisms exposed through spray drift and surface runoff. The Agency also expressed concern over the potential for phototoxicity across a range of non-target organisms.

Dow AgroSciences examined the ecological effects endpoints and environmental fate parameters for oxyfluorfen and the assumptions and methods used by the Agency to perform the assessment. Examples of recalculated Risk Quotients (RQs) are provided in this report for key oxyfluorfen uses demonstrating typical reductions in risk on the order of 65% or greater, when corrected or more appropriate inputs are utilized in the assessment. Certain RQs still exceed Levels of Concern, but there is no evidence to support a conclusion that actual adverse effects occur from the existing uses of oxyfluorfen. The screening-level methods used in the Agency Tier I and Tier II assessment employ conservative assumptions to be protective and do not provide probability statements regarding risk. Therefore, in the absence of confirmatory data from other lines of evidence, there is no scientific basis for concern over adverse effects on terrestrial plants, aquatic organisms, or other non-target organisms considered in the U.S. EPA assessment.

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Science Chapter for Oxyfluorfen

DATA REQUIREMENTS

None

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STATEMENT OF NO DATA CONFIDENTIALITY CLAIMS

Compound: Oxyfluorfen

Title: Dow AgroSciences' Response to the U.S. EPA's Environmental Fate and Effects
Division Science Chapter for Oxyfluorfen

No claim of confidentiality is made for any information contained in this study on the basis of its falling within the scope of FIFRA Section 10 (d)(1)(A)(B), or (C).*

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*In the United States, the above statement supersedes all other statements of confidentiality that may occur elsewhere in this report.

THIS DATA MAY BE CONSIDERED CONFIDENTIAL IN COUNTRIES OUTSIDE THE UNITED STATES.

STATEMENT OF COMPLIANCE WITH GOOD LABORATORY PRACTICE STANDARDS

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This study does not meet requirements of 40 CFR Part 160.

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QUALITY ASSURANCE STATEMENT

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NON-GLP STUDY

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Dow AgroSciences' Response to the U.S. EPA's Environmental Fate and Effects Division
Science Chapter for Oxyfluorfen

ABSTRACT

The U.S. EPA Environmental Fate and Effects Division (EFED) conducted a standard Tier I and Tier II ecological risk assessment and concluded that the greatest risks of oxyfluorfen use were associated with terrestrial plants exposed through spray drift and aquatic organisms exposed through spray drift and surface runoff. EFED also expressed concern over the potential for phototoxicity across a range of non-target organisms.

Dow AgroSciences (DAS) examined the ecological effects endpoints and environmental fate parameters for oxyfluorfen and the assumptions and methods used by EFED to perform the assessment. Examples of recalculated Risk Quotients (RQs) are provided in this report for key oxyfluorfen uses demonstrating typical reductions in risk on the order of 65% or greater, when corrected or more appropriate inputs are utilized in the assessment. Certain RQs still exceed Levels of Concern, but there is no evidence to support a conclusion that actual adverse effects occur from the existing uses of oxyfluorfen. In particular, when oxyfluorfen is used according to label directions, there are no data from field studies, monitoring studies, or incidents indicating problems with this herbicide relative to non-target organisms. The screening-level methods used in the Agency Tier I and Tier II assessment employ conservative assumptions to be protective and do not provide probability statements regarding risk. Therefore, in the absence of confirmatory data from other lines of evidence, there is no scientific basis for concern over adverse effects on terrestrial plants, aquatic organisms, or other non-target organisms considered in the EFED assessment.

The EFED aquatic exposure assessment included estimates of oxyfluorfen concentrations in drinking water derived from surface water sources, which were used in the Agency's human

health assessment. DAS provides more refined modeling results and alternative interpretations of monitoring data to improve the estimated drinking water concentrations.

INTRODUCTION

As requested by the EPA, Dow AgroSciences (DAS) is providing comments on the Agency's Environmental Fate and Effects (EFED) Division assessment for oxyfluorfen. These comments address errors, inconsistencies, omitted studies, and interpretations found in the EPA document entitled: Environmental Fate and Effects Division Science Chapter for the Oxyfluorfen Reregistration Eligibility Decision Document, Date: 31 August 2001, DP Barcode D250187, PC Code No.: 111601, Memorandum and EFED Chapter. However, the preparation of these comments did not include an exhaustive examination of all data summarized within the Agency's document. DAS only recently acquired oxyfluorfen registrations through its purchase of the agricultural products of the Rohm and Haas Company and is still in the process of transferring, cataloging, and archiving the data files. The files needed for extensive error checking were therefore unavailable within the allowed 30-day comment period. In these comments, DAS discusses areas where improvement in the risk assessments could occur through our current understanding of available information and wishes to reserve the option for submitting further error correction and suggestions for improvement as study files become accessible.

GENERAL COMMENTS

EFED conducted a standard Tier I and Tier II ecological risk assessment and concluded that the greatest risks of oxyfluorfen use were associated with terrestrial plants exposed through spray drift and aquatic organisms exposed through spray drift and surface runoff. EFED also expressed concern over the potential for phototoxicity across a range of non-target organisms.

DAS examined the ecological effects endpoints and environmental fate parameters for oxyfluorfen and the assumptions and methods used by EFED to perform the assessment. Examples of recalculated Risk Quotients (RQs) are provided in this report for key oxyfluorfen uses demonstrating typical reductions in risk on the order of 65% or greater, when corrected or more appropriate inputs are utilized in the assessment. Certain RQs still exceed Levels of

Concern, but there is no evidence to support a conclusion that actual adverse effects occur from the existing uses of oxyfluorfen. In particular, when oxyfluorfen is used according to label directions, there are no data from field studies, monitoring studies, or incidents indicating problems with this herbicide relative to non-target organisms. The screening-level methods used in the Agency Tier I and Tier II assessment employ conservative assumptions to be protective and do not provide probability statements regarding risk. Therefore, in the absence of confirmatory data from other lines of evidence, there is no scientific basis for concern over adverse effects on terrestrial plants, aquatic organisms, or other non-target organisms considered in the EFED assessment.

The EFED aquatic exposure assessment included estimates of oxyfluorfen concentrations in drinking water derived from surface water sources, which were used in the Agency's human health assessment¹. DAS provides more refined modeling results and alternative interpretations of monitoring data to improve the estimated drinking water concentrations.

SPECIFIC COMMENTS: OXYFLUORFEN, ENVIRONMENTAL ASSESSMENT. EFED
CHAPTER

Page 1, Cover Memo

“In addition, the potential for oxyfluorfen (as a light-dependent peroxidizing herbicide) to be more toxic in the presence of intense sunlight may lead to the occurrence of environmental effects that are not predicted by standard guideline toxicity tests.”

The potential for oxyfluorfen to be more toxic in the presence of intense sunlight is a theoretical assertion. In aquatic habitats, intense sunlight is present only in shallow, clear bodies of water. In these habitats, oxyfluorfen is also subject to rapid photolytic degradation that would

¹ Oxyfluorfen. Human Health Risk Assessment. HED Chapter for the Reregistration Eligibility Decision Document. Registration Case No. 2490. Chemical No. 111601. DP Barcode D250186

ameliorate concerns for potential enhanced toxicity in these habitats. Terrestrial avian and mammalian species are generally well shielded from intense direct sunlight by feathers or fur, and by behavioral attributes such as burrowing (for small mammals) or nocturnality, further ameliorating concerns for potential enhanced toxicity to these species. Furthermore, oxyfluorfen degrades rapidly in soil exposed to sunlight.

Page 2, Cover Memo, Ecological Effects, 2. Aquatic Invertebrate Life Cycle

“Raw data for this supplemental study must be submitted and satisfactorily reviewed... .”

The raw data will be submitted and will show that this study is acceptable and should be rated as “Core.”

Page 3, Cover Memo, Ecological Effects, 6. Phototoxicity study

“...EFED is requesting that registrants of herbicides with this mode of action submit phototoxicity studies.”

This theoretical concern should more properly be addressed as a research topic outside of the reregistration process.

Page 3, Cover Memo, Ecological Effects, 9. Estuarine/marine fish early life stage and aquatic invertebrate life cycle toxicity tests

“Acute toxicity testing demonstrated that the estuarine/marine test species were more sensitive to oxyfluorfen than freshwater species.”

There is no evidence to suggest that estuarine/marine fish are more sensitive than freshwater fish. In sheepshead minnow exposed for 96 hours under static conditions (MRID 416988-01), survival was 100% in all test levels indicating that the LC50 was greater than 170 µg/L (mean measured concentration) and the NOEC was equal to 170 µg/L. EFED assumed with excessive conservatism an estimate of an LC50 equal to 170 µg/L. Because EFED used this value to

compare with the observed LC50's in freshwater fish ranging from 200 – 410 µg/L, EFED incorrectly concluded that estuarine/marine fish are more sensitive than freshwater fish to the effects of oxyfluorfen. The data does not support this conclusion. The more reasonable conclusion that can be drawn from this (albeit limited) data is that estuarine/marine fish and freshwater fish are equally sensitive to the effects of oxyfluorfen.

Page 6, Oxyfluorfen Formulations and Use Characterization

“One exception is non-bearing citrus which has higher annual application rates (maximum of 6.0 lbs ai/acre/year) and multiple applications per year”

Maximum application for non-bearing citrus should be 4.0 lbs ai/acre/year.

Page 10, Risks to Aquatic Organisms

“Exceedences of the Acute Risk LOCs may also be expected based on limited field studies.”

Two field studies were omitted in this discussion (MRID 94749, MRID 127936). These agricultural field-scale runoff studies were conducted in MO and NC under natural rainfall over two growing seasons. No detectable residues were found in pond water or sediment under conditions where runoff occurred. The cited study involving granular product applied in a commercial nursery with a containment pond has little relevance to most use patterns or valued aquatic habitat.

Page 12, Risks to Terrestrial Organisms

“As discussed above and in Section VII, the potential for phototoxic effects is a serious concern. Anemia and other hematologic consequences were observed in the developmental studies in mammals. In wild mammal populations, these hematologic effects have the potential to magnify

since the lack of natural sunlight in the laboratory does reduce the likelihood of activating the phototoxic effects of oxyfluorfen.”

The argument that the hematologic effects seen in the laboratory rodent assays “has the potential to magnify” in the natural environment is baseless and logically flawed. EFED states that the same “phototoxic compounds” resulting from sunlight and oxyfluorfen exposure in plants also occurs in animals causing the hematological effects seen in the laboratory studies. However, EFED also acknowledges that laboratory rodents are not exposed to sunlight nor to levels of artificial light needed to produce these phototoxic compounds. So, what evidence exists to prove that the hematologic effects seen in the laboratory rodents (exposed to light levels too low to activate oxyfluorfen-mediated peroxidation reactions) were caused by the same mechanism of light-dependent peroxidation that occurs in plants under full sunlight conditions? EFED relies on conjecture to make this connection. The recommended ambient light level in laboratory rodent facilities is approximately 30 foot-candles in the room and 12 foot-candles at the cage (NRC, 1996) to prevent retinal degeneration in laboratory rats. Outdoor daytime light levels are needed to cause photoactivation of oxyfluorfen in plants and are typically well in excess of 1000 foot-candles. It is unlikely that the very low light levels experienced by laboratory rodents could be responsible for the hematological effects seen in the one subchronic study cited by EFED (MRID 449331-01) making the “serious concern” for magnification of an effect in wild mammals unfounded.

“Although no phototoxic effects were observed in the avian reproduction studies, the likelihood that they would be observed in the wild does exist.”

This statement is worded in a manner that lends excessive credence to a hypothetical assertion. There is no “likelihood that they would be observed in the wild”, rather there is only an allegation founded upon no data. The fact (stated by EFED) that “no phototoxic effects were observed in the avian reproduction studies” may actually reflect the reality that there are no phototoxic effects in birds.

Page 16, Table 3

Some of the PRZM/EXAMS input parameters are incorrect for a final, most appropriate simulation for use in a Tier II aquatic ecological or human health (drinking water) risk assessment. Correct values are detailed in a recently completed modeling study that will be submitted by DAS in the near future (Snyder and Carbone, 2001). The input parameter values related to soil sorption and dissipation recommended in this report were selected by conservative interpretation of input guidelines in conjunction with calibration and validation to field studies. A realistic yet conservative representation of oxyfluorfen fate in soil was achieved by correctly accounting for the key dissipation process of soil photolysis.

Both the EFED assessment and the subsequent modeling study (Snyder and Carbone, 2001) acknowledge the impact of data gaps in the area of aquatic degradation. Because no measured data exist, the assumption of one-half the soil metabolism degradation rate for degradation in water (KBACW, KBACS) results in extremely long exposure periods in the simulated EPA standard farm pond or index reservoir. DAS suggests that this conservative assumption is not accurate for oxyfluorfen and that conduct of an aerobic aquatic metabolism study will generate data supporting considerably lower simulated chronic water exposure concentrations. DAS intends to submit a guideline aerobic aquatic metabolism study and modeling results to refine the Tier II water exposure assessment.

See the comments below on Pages 80-82, PRZM input file 10; IR Oregon Apple for specific line-by-line corrections in PRZM and EXAMS input parameter values.

Page 17, V. Drinking Water Assessment Summary

“The proposed surface water-derived drinking water concentrations are:

23.4 µg/L for the 1 in 10 year annual peak concentration (acute)

7.1 µg/L for the 1 in 10 year annual mean concentration (chronic) and

5.7 µg/L for the 36 year annual mean concentration.”

The proposed surface water-derived drinking water concentrations are incorrect for two reasons. First, the estimates come from a conservatively designed Tier II screening model scenario (the index reservoir) that has not been verified with measurement data. As such the predicted concentrations do not meet the FQPA “reliable information” requirement necessary for use in human health risk assessment. Second, several of the PRZM/EXAMS input parameters used to run the index reservoir model scenario are incorrect (see comments on Page 16, Table 3 and Pages 80-82, PRZM input file 10; IR Oregon Apple).

DAS proposes the following alternative Tier II surface water-derived drinking water concentrations from Snyder and Carbone (2001), which come from model runs using the correct PRZM/EXAMS input parameters:

7.0 µg/L for the 1 in 10 year annual peak concentration (acute)

2.6 µg/L for the 1 in 10 year annual mean concentration (chronic) and

2.2 µg/L for the 36 year annual mean concentration² (lifetime).

Relative to the EFED proposed concentrations, these represent decreases of $1-7.0/23.4 = 0.70$, $1-2.6/7.1 = 0.634$, and $1-2.2/5.7 = 0.614$, with an average of 0.649 or 65%.

“There are limited surface water monitoring data available for oxyfluorfen; however, these data are not adequate to perform a quantitative drinking water assessment.”

DAS agrees with EFED that monitoring data are scarce. However, the cited USGS study (Bergamaschi et al., 1997) appears to be quite representative of the rainy season surface water suspended sediment loading during the peak use period of oxyfluorfen in California’s Central Valley, the highest intensity use area. The equilibrium partitioning assumption to estimate the dissolved concentration in water is valid, although the assumed K_d of 100 is too low for sediment, which is enriched in organic matter relative to field soil. The estimated maximum

² Upper 90th percentile confidence interval.

concentration of 0.27 µg/L is therefore probably too high, yet it is at least an order of magnitude lower than the alternative proposed concentrations coming from corrected Tier II modeling. This order of magnitude discrepancy between predicted and observed concentrations is typical for most pesticides. Therefore, DAS proposes that the data considered to be reliable information suitable for FQPA human health risk assessment should be the monitoring data supporting a concentration no greater than 0.27 µg/L.

It is our understanding the mini-pilot monitoring study of the USEPA/USGS/USDA/ACPA interagency work group developing improved surface water models will include a watershed in Oregon in which oxyfluorfen is used on apples. The mini-pilot study is scheduled to initiate in the fourth quarter of 2001. DAS recommends the data from this study be examined to confirm the proposed maximum concentration of 0.27 µg/L in drinking water.

Pages 19-20, Reported Aquatic Incidents

“A truck carrying formulated oxyfluorfen (Goal 2XL) crashed on a bridge spilling approximately 20,000 gallons of herbicide into the creek yards from where the creek enters the Columbia River. ... This spill was estimated to cause a 35% decrease in the numbers of adult Chinook salmon and a 26% decrease in the numbers of steelhead passing over the Dalles Dam.”

The volume of material spilled in this incident was not 20,000 gallons (which is far in excess of what could be transported by a tractor-trailer). Rather, the volume spilled was estimated by Oregon Department of Environmental Quality to be 2600 gallons, equivalent to approximately 20,000 pounds of Goal 2XL Herbicide (See ODEQ website <http://www.deq.state.or.us/news/releases/018.htm>). There is no evidence on which to base a claim that the spill had any effect on migrating salmon in the Columbia River. To the contrary, evidence collected in the course of the continuing spill remediation indicates that salmon spawning and migration in Fifteen Mile Creek and the Columbia River is greater than average this year, suggesting that the spill had no effect on salmon migration or spawning whatsoever.

Page 21, Table 5

Using the 65% correction factor for PRZM/EXAMS modeling discussed above (Page 17, V. Drinking Water Assessment Summary), more realistic Tier II EECs can be calculated for the standard EPA farm pond. For example, the Apples (Oregon) 2.0 lb ai/acre 1 ground application Tier II concentrations ($\mu\text{g/L}$) change from 8.07 to 2.83 for peak, 4.96 to 1.74 for 21 d, and 3.90 to 1.37 for 60 d.

Page 23, Table 6

Corrected Tier II acute RQs based on the EEC corrections given above for Page 21, Table 5 can be calculated. For example, the Apples (Oregon) 2.0 lb ai/acre 1 ground application Tier II acute RQs change from 0.04 to 0.01 for FW fish, 0.10** to 0.04 for FW invertebrates, 0.05* to 0.02 for E fish, and 0.25** to 0.09* for E invertebrates. Two of the three exceedences of LOCs disappear, and the remaining exceedence becomes less restrictive.

Page 24, Aquatic Plants

Corrected Tier II acute RQs based on the EEC corrections given above for Page 21, Table 5 can be calculated. For example, the Apples (Oregon) 2.0 lb ai/acre 1 ground application Tier II acute RQ for FW algae (Table G-2) changes from 27.8 to 9.7. A more appropriate acute endpoint is found in a recent study (98RC-209, to be submitted) in which *Pseudokirchneriella (Selenastrum)* sp. was exposed to oxyfluorfen for 10 days in a microcosm experimental design. The day 10 NOEC for biomass and growth rate was $>2.9 \mu\text{g/L}$. Assuming conservatively that this value is equivalent to an acute EC_{50} , then the RQ of 9.7 declines to 0.97.

Page 25, Aquatic Organism Risk Characterization

“The risks to aquatic plants are of the greatest concern”

EFED states acute risks to aquatic plants are the greatest concern in the aquatic risk assessment. DAS agrees that this is true based solely on the Tier II RQs. However, oxyfluorfen is one of the least mobile, most hydrophobic herbicides. This suggests that these concerns do not translate into actual adverse impacts, because numerous other herbicides that are equally active on aquatic plants and are far more mobile are safely used in similar situations.

“The presence of oxyfluorfen pond water from a nursery after a realistic application in a nursery field has been documented”

The cited nursery containment pond study has little relevance to other application sites (specialized nursery landscape) or water bodies (a containment pond is not valuable aquatic habitat). The finding of concentrations above the water solubility limit suggests the study does not represent the typical case where trace levels are found in water.

Page 26, Aquatic Organism Risk Characterization

“Limited monitoring data also provide further information to the evaluation of environmental risk to aquatic organisms.”

The citation of the Bergamaschi monitoring work does not correspond with that discussed in other sections of the document (see Page 17, V. Drinking Water Assessment Summary and Appendix C). Neither the bibliographic reference nor the reported concentrations agree between the sections. DAS assumes the 0.27 µg/L maximum estimated dissolved concentration cited on page 27 is correct, because it appears to better represent the typical concentration during the short-term (8 d) monitoring study (Figure 1, Appendix C).

Page 27, Aquatic Organism Risk Characterization

“As a result of the spill ... on 24 August 2000 ...”

The spill occurred in the early morning hours of 22 August 2000.

Page 27, Uncertainties in the Aquatic Assessment

Exposure model uncertainty relative to the scenarios, model algorithms, and model parameterization is not discussed. In general, the screening level model and EFED parameterization policy bring into the assessment numerous conservative assumptions that serve to increase predicted concentrations.

A major uncertainty on the effects side is the assumption that single species acute and chronic toxicity endpoints are good indicators of adverse impact at the levels of population and community.

Page 31, Toxicity to Terrestrial Plants

“In general, toxicity tests demonstrate oxyfluorfen negatively impacts seedling emergence and vegetative vigor of terrestrial plants.”

Numerous deficiencies exist in the guideline studies [123-1(a) and 123-1(b)] submitted for phytotoxicity. The poor analytical recoveries (<10% to 319%), lack of an appropriate dose range, lack of a maximum use rate, inappropriate dilution series, and inappropriate test conditions combine to make any conclusions from these studies of suspect value. DAS therefore agrees to conduct repeat studies to correct these deficiencies and provide reliable endpoints. The seed germination study will not be repeated.

Pages 31-32, Reported Incidents

Incidents reported on non-target crops are not necessarily related to ecological effects.

Unintended crop damage is a product liability concern, which is managed and mitigated through product stewardship programs or the legal system. For an incident report to have significance for ecological effects on non-target terrestrial plants, specific definition of ecological entities requiring protection in sensitive areas is necessary.

Pages 32-34, Exposure, Birds and Mammals

The highest one-day residue is an inappropriate exposure to compare to a chronic ecotoxicological endpoint and requires correction by time averaging. A typical exposure period for a chronic avian study is 22 weeks. Therefore, using the same assumptions in the FATE5 model of linear superposition of multiple applications and first-order decline of residues with a half-life of 35 d, the appropriate EEC for use in risk assessment would be the mean daily exposure over a period of 22 weeks. The average over the 22 week period takes into account mass addition by repeated application and mass removal by foliar dissipation. For example, the Table 8 scenario of Citrus – Florida (2 lbs ai/ac/app, 2 app., ground, 30 day interval) has an initial predicted maximum residue on short grass of $2 \times 240 \text{ ppm} = 480 \text{ ppm}$ on day zero and a 22-week average of 291 ppm. This is 61% lower than the highest one-day residue of 745 ppm, which is applicable only to acute endpoints.

It should be pointed out that most sprayed vegetation would become unpalatable to terrestrial birds and mammals after 2 days, due to the contact activity of oxyfluorfen on target weeds. If tolerant weeds are treated, then another contact herbicide will be added to the tank mix, which could extend the period of palatability to up to 2 weeks for a slow-acting material such as glyphosate. However, this results in a maximum of $2 \text{ applications} \times 2/22 = 18.2\%$ of the postulated chronic exposure period of 22 weeks, thus greatly reducing the possibility of chronic effects developing in exposed herbivorous birds and mammals. It is also doubtful whether the longevity of treated insects is sufficient to generate chronic exposure in most instances.

Pages 34-35, Exposure, Plants

The exposure assessment method used in this section is Tier I, which by definition is a screening method that cannot predict the likelihood of exposure occurring in dry or semi-aquatic areas. After many years of widespread commercial use of oxyfluorfen, DAS is unaware of any evidence that actual exposure of valued non-target terrestrial plants commonly occurs in sensitive areas, nor has EFED cited such evidence.

Pages 35-37, Risk Quotients, Birds and Mammals

As stated above in the comment on Pages 33-34, Exposure, Birds and Mammals, an incorrect EEC was used in the chronic RQ calculations (Tables G-3, G-4, G-5). The correct time-averaged predicted maximum residue on short grass for the example Table 8 scenario of Citrus – Florida (2 lbs ai/ac/app, 2 app., ground, 30 day interval) is 291 ppm instead of the highest one-day residue of 745 ppm. This lowers the RQ from 14.9 to 5.8. Maximum and mean predicted residues on all food items would be reduced by the same proportion, as would the RQs associated with those food items. Note also the previous comment regarding unpalatability of vegetation after 2 to 14 d following herbicide treatment, which actually eliminates the need to calculate a chronic RQ for herbivorous animals (mitigates chronic exposure). Longevity of treated insects is probably insufficient to provide chronic exposure.

Pages 38-39, Risk Quotients, Terrestrial Plants

Again, the method used to calculate RQs is Tier I, which by definition is a screening method that cannot predict the likelihood of effects occurring in dry or semi-aquatic areas. The effect endpoints appear to be the most sensitive reported monocot or dicot EC₂₅ values. Reduction of vegetative vigor by 25% is not easily linked to an actual ecological effect, either for an individual plant or for higher ecosystem structural entities such as populations or communities. Reduction of seedling emergence by 25% could be ecologically significant but only in the context of a more definitive problem formulation in which valued ecological entities are identified in sensitive areas requiring protection. Therefore, the outcome of the Tier I assessment

does not predict actual ecological impacts. After many years of widespread commercial use of oxyfluorfen, DAS is unaware of any evidence that actual effects on valued non-target terrestrial plants commonly occur in sensitive areas, nor has EFED cited such evidence.

Page 42, Terrestrial Organism Risk Characterization, Risks to Birds and Mammals.

Chronic RQs calculated with correct EECs greatly reduce the risk for all bird and mammal food items. In addition, palatability of treated foliage declines severely over a period of days to a few weeks, eliminating chronic exposure to herbivores. Insectivore chronic risk is reduced by the short life cycle of treated insects relative to the 22-wk exposure required to elicit chronic effects in birds.

Pages 43-44, Risks to Terrestrial Plants

The protoporphyrinogen IX oxidase inhibiting herbicides such as oxyfluorfen are well known to require complete spray coverage of the foliage and meristematic regions to kill susceptible plants. As acknowledged by the Agency, damaged plants may recover from injury. The lack of translocation within the plant is a limiting factor in their biological activity, such that spray droplets must land on all the viable meristems to completely stop plant recovery. In addition, the rapid metabolism of oxyfluorfen allows injured plants to recover rapidly, often with complete recovery within 2 weeks after treatment. The plant may appear brown and desiccated, yet the meristems, if uninjured, will rapidly produce new growth. Oxyfluorfen has a very flat dose response curve under field conditions such that twice the application rate is required to cause 100% injury compared to the rate that causes 90% injury.

The RQs calculated for oxyfluorfen for both endangered and non-endangered plant species are most likely conservative in nature. Greenhouse/growth chamber data is a poor predictor of field effects. Typically, application rates required to cause comparable injury differ by a factor of 3 to 10X between the greenhouse and field.

All of the incident data cited by the Agency, by their own recognition, includes more than one product, which could account for the reported injuries. Out of the 7595 drift incidences reported by AAPCO for the period 1996 – 1998, there were no reported incidences of oxyfluorfen drift.

Pages 80-82, PRZM input file 10; IR Oregon Apple

As indicated in the comments on Page 16, Table 3 above, certain of the PRZM/EXAMS input parameters are incorrect for a final, most appropriate simulation for use in a Tier II risk assessment. Given below are corrected PRZM and EXAMS input files suitable for Tier II risk assessment (Snyder and Carbone, 2001).

PRZM-3.12 Input File Summary– Guidelines Revised Input Scenario(V)

PARAMETER	PRZM-3.12 VARIABLE	VALUE USED	SOURCE/RATIONALE
Simulation Start Date	ISDAY, ISMON, ISTYR	01-Jan-48	Beginning of met. data
Simulation End Date	IEDAY, IEMON, IEYR	31-Dec-83	End of met. data
Hydrologic Data			
Precipitation (cm)	PRECIP	Daily values	MLRA A2 Met. Station W24232
Air Temperature (deg. C)	TEMP	Daily avg.	Salem, OR
Pan Factor	PFAC	0.74	EPA Standard Scenario: OR Apple
Snow Factor (cm/degree C)	SFAC	0.15	EPA Standard Scenario: OR Apple
Pan Evaporation Flag	IPEIND	0	EPA Standard Scenario: OR Apple
Evaporation Extraction, Minimum depth (cm)	ANETD	17.0	EPA Standard Scenario: OR Apple
Crop Condition (initial)	ISCOND	3	EPA Standard Scenario: OR Apple
Erosion	ERFLAG	4	EPA Standard Scenario: OR Apple
USLE Soil Erodibility Factor	USLEK	0.43	EPA Standard Scenario: OR Apple
USLE Topographic Factor	USLELS	3.30	EPA Standard Scenario: OR Apple
USLE Supporting Practice Factor	USLEP	1.0	EPA Standard Scenario: OR Apple-Value Corrected
USLE Cover Management Factors	USLEC	0.01, 0.01, 0.01	EPA Standard Scenario: OR Apple-Format Corrected
Manning's N	MNGN	0.1, 0.1, 0.1	Conservative, Realistic Value (Clipped Range)
USLEC & Manning's N Start Date	GDUSLEC,GMUSLEC	0103, 0105, 0112	EPA Standard Scenario: OR Apple-Format Corrected
Area of Field (ha)	AFIELD	172.8	EPA Standard Scenario: OR Apple-Value Corrected
Location of NRCS 24-hour Hyetograph	IREG	3	EPA Standard Scenario: OR Apple
Land Slope (%)	SLP	15.00	EPA Standard Scenario: OR Apple
Hydraulic Length (m)	HL	464.0	USEPA Index Reservoir
Irrigation	IRFLAG	0	EPA Standard Scenario: OR Apple
Crop Data			
Crop Emergence Date	EMD, EMM, IYREM	1-Apr-48 to 83	EPA Standard Scenario: OR Apple
Crop Maturation Date	MAD, MAM, IYRMAT	15-May-48 to 83	EPA Standard Scenario: OR Apple
Crop Harvest Date	HAD, HAM, IYRHAR	15-Dec-48 to 83	EPA Standard Scenario: OR Apple
Maximum Interception Storage (cm)	CINTCP	0.25	EPA Standard Scenario: OR Apple
Maximum Active Root Depth (cm)	AMXDR	17.0	EPA Standard Scenario: OR Apple
Maximum Areal Coverage (%)	COVMAX	100.0	EPA Standard Scenario: OR Apple
Soil Surface Condition After Harvest	ICNAH	3	EPA Standard Scenario: OR Apple
Runoff Curve Number for AM-II (fallow, crop, residue)	CN	91, 71, 71	EPA Standard Scenario: OR Apple
Max. Dry Weight of Crop	WFMAX	0	Required if CAM=3
Max. Canopy Height	HTMAX	600	EPA Standard Scenario: OR Apple
Pesticide Application Data			
Number of Applications	NAPS	36	Annual Application
Application Date	APD, APM, IAPYR	07-Jan-48 to 83	USEPA Value
Ideal Soil Moisture Flag for Applications	FRMFLG	0	No moisture Test for Application
Bi-Phase Degradation	DKFLG2	0	Bi-Phase degradation Not Simulated
Application Model			
Chemical Application Model	CAM	2	Linear Foliar Based on Crop Canopy
Incorporation Depth (cm)	DEPI	0.00	Default 4cm used for non-intercepted Application
Target Application Rate (kg/ha)	TAPP	2.24	2 lb A.I./ac Maximum Label Rate
Application Efficiency (fraction)	APPEFF	0.99	99%-Ground Spray Default
Spray Drift (fraction)	DRFT	0.064	6.4% - Ground Spray -Format Fixed
Plant Uptake Efficiency Factor	UPTKF	0.0	No Uptake Simulated
Pesticide Fate Data			
Volatilization Decay Rate (/day)	PLVKRT	0.0	No Volatilization
Plant FoliageDecay Rate (/day)	PLDKRT	0.0016	Same as Aerobic Soil Rate
Foliar Extraction Coefficient (washoff/cm rain)	FEXTRC	0.5	USEPA Value
Diffusion Coefficient	DAIR	4300., 4300., 4300.	PRZM Manual Default Value
Henry's Law Constant	HENRYK	5.76E-6, 0.0, 0.0	EPA Oneliner, Insignificant in Metabolites
Enthalpy of Vaporization	ENPY	20., 20., 20.	PRZM Manual Default Value
Pesticide Fate Data			
KD Model Flag	PCMC	0	Koc Entered
Soil-Water Adsorption Coeff. (Kd ml/gm)	KD	281.359(3), 135.786, 25.6893, 17.7379, 8.5631	Calculated from Koc of 12233 and OC
Decay Rate Dissolved (/day)	DWRATE	0.02596, 0.0012(6)	Effective from Photolysis(28 days) and Soil T1/2 Top
Decay Rate, Adsorbed (/day)	DSRATE	0.02596, 0.0012(6)	576 day Soil T1/2 (No T-Testor *2, Large Values)
Soils Data			
Soil Type	STITLE	Cornelius Silt Loam	EPA Standard Scenario: OR Apple
Number of Horizons	NHORIZ	7	EPA Standard Scenario: OR Apple
Total Depth of Soil Core (cm)	CORED	148	EPA Standard Scenario: OR Apple
Horizon Thickness (cm)	THKNS	2.0, 8.0, 5.0, 13, 15, 55, 50	EPA Standard Scenario: OR Apple
Layer Thickness (cm)	DPN	0.1, 0.1, 1.0, 1.0, 1.0, 5.0, 5.0	EPA Standard Scenario: OR Apple
Bulk Density (g/cm3)	BD	1.30(3), 1.38, 1.58, 1.52, 1.46	EPA Standard Scenario: OR Apple
Field Capacity (cm3/cm3)	THEFC	0.329(3), 0.338, 0.340, 0.358, 0.202	EPA Standard Scenario: OR Apple
Wilting Point (cm3/cm3)	THEWP	0.099(3), 0.108, 0.110, 0.148, 0.142	EPA Standard Scenario: OR Apple
Initial Soil Moisture (cm3/cm3)	THETO	0.329(3), 0.338, 0.340, 0.358, 0.202	Field Capacity (worst-case runoff)
Organic Carbon (%)	OC	2.30(3), 1.11, 0.21, 0.145, 0.07	EPA Standard Scenario: OR Apple
Hydrodynamic Dispersion (cm2/day)	DISP	-	Not used
Soil Drainage Parameter (1/day)	AD	-	Not used

EXAMS Input File Summary – Guidelines and Guidelines Revised Input Scenario(IV&V,
Identical)

CHEMICAL PARAMETERS	NAME	VALUES	SOURCE/JUSTIFICATION
Molecular weight (g/mole)	MWT	361.7	Rohm and Haas, Render Document
Henry's law constant (atm-m3/mole)	HENRY	2.34959E-07	Rohm and Haas, Render Document
Solubility (mg/L)	SOL	1.16E+00	Rohm and Haas, Render Document*10 (guidelines)
Vapor pressure (torr)	VAPR	1.949E-07	Rohm and Haas, Render Document
Sediment part. coef. (mg/kg)/(mg/L)	KPS	---	Calculated by EXAMSII
Organic carbon partition coefficient (L/kg)	KOC	1.223E+04	Rohm and Haas, Render Document (Average)
Octanol water partition coefficient (L/kg)	KOW	---	Not Used
Water col bact. rate (hr-1)(cfu/ml)-1	KBACW	2.4962E-05	2*Soil T1/2 (1152 Days)
Benthic bacteria rate (hr-1)(cfu/ml)-1	KBACS	2.4962E-05	2*Soil T1/2 (1157 Days)
Direct photol rate (hour-1)	KDP	1.069E-02	Rohm and Haas, Render Document (2.7 Days)
Acid hydrolysis rate constant (hour-1/mole)	KAH	---	Not Used
Neutral hydrolysis rate constant (hour-1)	KNH	---	Not Used
Base hydrolysis rate constant (hour-1/mole)	KBH	---	Not Used
Sediment bacteria temp coefficient	QTBAS	2	USEPA Index Reservoir
Water bacteria temp coefficient	QTBAS	2	USEPA Index Reservoir
GEOMETRY PARAMETERS			
Segment area (m2)	AREA	52,609	USEPA Index Reservoir
Mixing length (m)	CHARL	1.395	USEPA Index Reservoir
Segment thickness (m)	DEPTH	2.74	USEPA Index Reservoir
Bed sediment segment thickness (m)	DEPTH2	0.05	USEPA Index Reservoir
Number of segments	KOUNT	2	USEPA Index Reservoir
Segment width (m)	WIDTH	82.2	USEPA Index Reservoir
Segment length (m)	LENG	640	USEPA Index Reservoir
Segment volume (m3)	VOL	144000.00	USEPA Index Reservoir
Segment volume (m3)	VOL2	2630.00	USEPA Index Reservoir
Cross Section for Turbulent Dispersion(m2)	XSTUR	52,609	USEPA Index Reservoir- Value Corrected
FLOW AND LOADING PARAMETERS			
Part flow advected	ADVPR	1.00E+00	USEPA Index Reservoir
Drift loadings (kg/hr)	DRFLD	0.00E+00	USEPA Index Reservoir
Evaporation (mm/month)	EVAP	0.00E+00	USEPA Index Reservoir
Pulse load (kg)	IMASS	0.00E+00	Spray drift - GroundSpray
Nonpoint sed load (kg/hr)	NPSER	0.00E+00	USEPA Index Reservoir
Nonpoint flow (m3/hr)	NPSFL	0.00E+00	USEPA Index Reservoir
Nonpoint chem load (kg/hr)	NPSLD	variable	PRZM-3.12
Precipitation load (kg/hr)	PCPLD	0.00E+00	USEPA Index Reservoir
Seepage flow (m3/hr)	SEEPS	0.00E+00	USEPA Index Reservoir
Stream flow (m3/hr): Calculated as the annual average runoff predicted by PRZM using the standard scenario input file	STFLO	8.334	USEPA Index Reservoir for OR Apple
Chem load in flow (kg/hr)	STRLD	0.00E+00	USEPA Index Reservoir
Stream-borne sed. (kg/hr)	STSED	0.00E+00	USEPA Index Reservoir
ENVIRONMENTAL PARAMETERS			
Anion exchange capacity (meq/100 g)	AEC	1.00E-02	USEPA Index Reservoir
Atmospheric turb (km)	ATURB	2.0	USEPA Index Reservoir
Plankton population (cfu/ml)	BACPL	1.0	USEPA Index Reservoir
Benthic bacteria (cfu/100 g)	BNBAC	37	USEPA Index Reservoir
Benthic biomass (g/m2)	BNMAS	6.00E-03	USEPA Index Reservoir
Bulk density (g/cm3)	BULKD	1.85	USEPA Index Reservoir
Cation exchange capacity (meq/100 g)	CEC	1.00E-02	USEPA Index Reservoir
Mean monthly cloud cover (tenths of sky)	CLOUD	0	USEPA Index Reservoir
Distribution Factor (dimensionless)	DFAC	1.19	USEPA Index Reservoir
Dissolved oxygen (mg/L)	DISO2	5.0	USEPA Index Reservoir
Dissolved organic carbon (mg/L)	DOC	5.0	USEPA Index Reservoir
Vertical dispersion coefficient (m2/hr)	DSP	3E-05	USEPA Index Reservoir
Fraction of organic carbon (dimensionless)	FROC	0.04	USEPA Index Reservoir
Mean monthly ozone (cm NTP)	OZONE	0.3	USEPA Index Reservoir
Percent water benthic (%)	PCTWA	137.00	USEPA Index Reservoir
pH	PH	7.0	USEPA Index Reservoir
pOH	POH	7.0	USEPA Index Reservoir
Avg. monthly rainfall (mm/month)	RAIN	n/a	USEPA Index Reservoir
Relative humidity (%saturation)	RHUM	n/a	USEPA Index Reservoir
Suspended sediment (mg/L)	SUSED	30.00	USEPA Index Reservoir
Water temperature (°C): Month 1,2,3	TCEL	0.00,1.09,6.26	USEPA Index Reservoir - Monthly temperatures
Water temperature (°C): Month 4,5,6	TCEL	13.21,18.61,23.73	
Water temperature (°C): Month 7,8,9	TCEL	26.09,25.04,20.91	
Water temperature (°C): Month 10,11,12	TCEL	14.5,7.04,0.99	Not Changed for Oregon
Wind (m/s)	WIND	1.00	USEPA Index Reservoir

REFERENCES

NRC, "Guide for the Care and Use of Laboratory Animals. Institute of Laboratory Animal Resources," Commission on Life Sciences, National Research Council. National Academy Press, Wash. DC. Pp. 34-35; 1996.

N.J. Snyder, J.P. Carbone, "Estimated Environmental Concentrations of Oxyfluorfen Residues in the Index Reservoir Resulting from Use on Apples," Internal report 01RC-1018 of the Rohm and Haas Company; 2001.